ZB-TFQ12

Installation and Maintenance Manual
Compact Vacuum Unit
Series ZB

CE

1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of “Caution”, “Warning” or “Danger”, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

⚠ **Caution**	Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
⚠ **Warning**	Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
⚠ **Danger**	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

⚠ Warning

- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
  Since the products specified here can be used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet specific requirements.
- **Only trained personnel should operate pneumatically operated machinery and equipment.**
  Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced personnel.
- **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**
  1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
  2) When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.
  3) Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create back pressure, i.e. incorporate a soft-start valve).
- **Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**
  1) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.
  2) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
  3) An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

⚠ Caution

- Ensure that the air supply system is filtered to 5 microns.

2 Specifications

Refer to the operation manual for this product.

3 Installation

3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

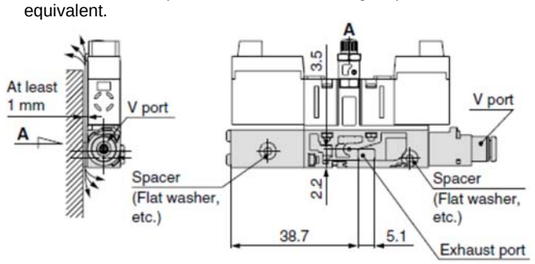
Note the following points when mounting and installing the product.

■ Common Precautions for Mounting and Installation

1) It is necessary to perform maintenance and replacement of the suction filter regularly to maintain the proper operation of the ejector and vacuum pump system. Ensure sufficient space for maintenance work when installing the product.
2) The filter case of this product is integrated with the vacuum piping. Secure sufficient space and some length of the tube with the piping (tubes) on the vacuum side so that the case can be removed.
3) Do not fix the piping on the vacuum side such that a load is always applied to the filter case in a bending or pulling direction. This can damage the body and/or the filter case.
4) If the ejector (silencer exhaust specification) is operated in a dusty environment or if there is dust on the surface of the workpieces, it can cause clogging of the silencing material as well as the suction filter due to dust being sucked in. Secure space necessary for the maintenance check and replacement of the silencer when the ejector performance decreases.
5) Keep the ambient temperature of the product between -5 and 50°C. In environments such as inside a panel where heat radiation efficiency is poor, the ambient temperature will rise due to the heat generation of the coil of the solenoid valve, causing malfunction.
6) When handling the product, do not lift it by the lead wires or cables of the solenoid valve, pressure sensor or pressure switch for vacuum. Otherwise, it can cause vacuum leakage or broken wire or damage to the product.

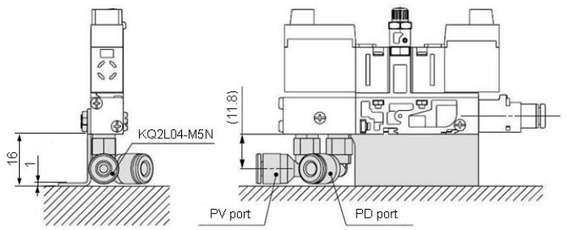
■ Mounting and Installation of Single Unit Ejectors

1) The tightening torque for mounting the product to the wall should be between 0.075 and 0.096Nm. Using excessive torque may cause damage to the body. (The width of the product is 10mm.)
2) Do not block the exhaust port of the ejector. The ejector of the single unit specification has only one exhaust port on one side. If the ejector is mounted with the exhaust port facing a wall, secure a space of at least 1mm between the product and the wall using a spacer, shim or equivalent.



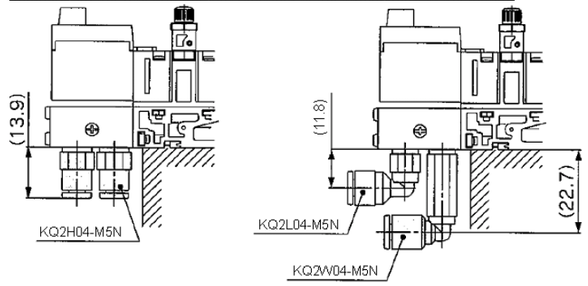
(3) Secure the space for connecting piping on the supply side when installing the product.

Mounting with a bracket for single unit (Width of the bracket: 1mm)



3 Installation (cont.)

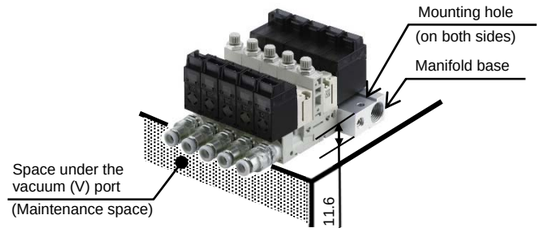
Mounting on the wall and the port released to the atmosphere at the bottom



Part No. of the bracket for single unit: ZB1-BK1-A (Provided with 2 mounting screws M2x14 with washer and 2 hexagon nuts M2.)
Recommended tube fittings for the set-up shown above: KQ2H04-M5N, KQ2L04-M5N, KQ2W04-M5N.

■Mounting and Installation of an Ejector of Manifold Specification

When mounting the manifold base, it is recommended to mount a spacer on the filter case side in order to make it easier to perform maintenance service of the filter element. (Width of the manifold base mounting hole: 11.6mm)



3.2 Environment

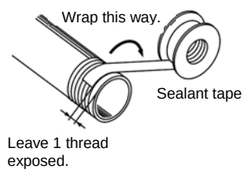
⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.

3.3 Piping

■Piping for Air Pressure Supply and Vacuum Pressure Supply

1) Preparation before piping
   Before piping, perform air blow (flushing) or cleaning to remove any cutting chips, cutting oil, dust, etc. from the piping.
2) Wrapping of pipe tape
   When installing piping or a tube fitting into a port, prevent cutting chips and sealant material from getting inside the product.
   If a sealant tape is used, leave 1 thread exposed at the end of threads.



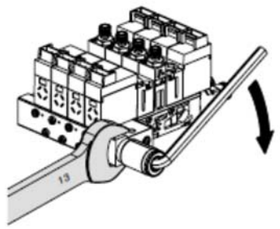
3) When connecting tubing, consider factors such as changes in the tubing length due to pressure, and allow a sufficient margin. Otherwise, it can damage the fitting and cause the tube to come off. Refer to Fittings & Tubing Precautions from 1 to 4 shown in Best Pneumatics 6 on SMC’s website (URL http://www.smcworld.com) for the recommended piping conditions.

3 Installation (cont.)

■Piping to the Manifold Base

1) For the PV port of the manifold base, use a tube fitting whose maximum bore size of the outside dimension is smaller than 12mm. Otherwise, the exterior of the fitting will interfere with the manifold base installation face.
   Recommended tube fittings:
   KQ2S06-01☐S, KQ2S04-01☐S

2) Follow the tightening instructions shown below for each thread.
   1/8 (PV port) : 7 to 9Nm
   Tightening torque is 3 to 5N as a guide.
   M5 (PV, PD port): After tightening by hand, increase the tightening by about 1/6 turn with a tightening tool.
   Tightening torque is 1 to 1.5N as a guide.



3) When mounting or removing the tube fitting, etc. to the manifold base, hold the manifold base hold the manifold base with a spanner.
   If the ejector/vacuum pump system is held, it may cause air leakage or damage to the product.

■Piping to the Vacuum (V) Port

1) Allow a sufficient margin of tube length when piping, in order to prevent twisting, tensile, moment loads, vibration or impact being applied to the tubes and fittings.
   This can cause damage to the tube fittings and crushing, bursting or disconnection of tubing.
2) Piping to the product is assumed to be static piping.
   If the tube moves, it may become worn, elongated or torn due to tensile forces, or disconnected from the fitting. Ensure the tube is in a static condition at all times before using.
3) Prevent the connected tube from being rotated.
   If the fittings are used in this way, the fitting may be broken.
4) Do not lift the product by holding the piping after the tube is connected to the vacuum (V) port.
   Otherwise, the filter case and/or the One-touch tube fitting will be damaged.

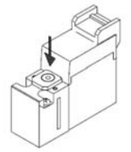
4 Settings

■Manual Override

Vacuum for the ejector or the vacuum pump system is generated or released by manual operation.
Use the manual override after confirming that there is no danger.

When operating the locking type with a screwdriver, turn it gently using a watchmaker’s screwdriver. (Torque: Less than 0.1Nm)

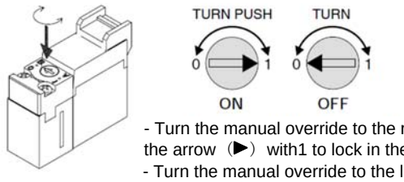
Non-locking push type (Tool required)



It is turned ON by pressing the manual override all the way in the direction indicated by the arrow (↓), and it is turned OFF by releasing it.

4 Settings (cont.)

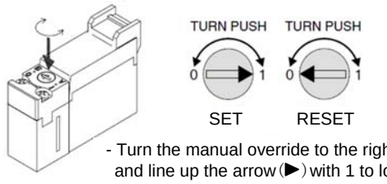
Locking type (Tool required) <Semi-standard>



- Turn the manual override to the right and line up the arrow (▶) with1 to lock in the ON state.
- Turn the manual override to the left and line up the arrow (◀) with 0 to unlock and recover the manual override.

注）ロック式マニュアルは、平常運転開始前に必ずロックを解除してください。

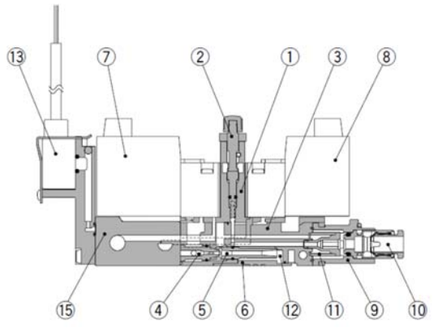
Locking push type (Tool required) <Latching type>



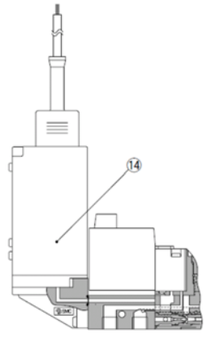
- Turn the manual override to the right and line up the arrow (▶) with 1 to lock in the SET state (flow from P to A).
- Turn the manual override to the left and line up the arrow (◀) with 0 to return it to the RESET state (flow from A to P). (It is set to RESET state when shipped.)

5 Maintenance

■Construction of ZB series



Manifold / With pressure sensor



Single unit / With vacuum pressure switch

5 Maintenance(cont.)

■Components

No.	Item	Main parts material	Remarks
(1)	Valve body assembly	Resin/HNBR	Solenoid valve mounting part
(2)	Needle assembly	Resin/ Brass/ NBR	For adjusting release flow, with lock nut retaining mechanism
(3)	Body	Resin	Bodies for ejector and for pump system both available.
(4)	Nozzle	Aluminum	For vacuum pump system: Spacer
(5)	Diffuser	Aluminum	For vacuum pump system: No diffuser
(6)	Silencer cover	Resin	

The components from (7) to (15) are available as service parts.

■Implement the maintenance and check shown below in order to use the ejector and the vacuum system safely and in an appropriate way for a long period of time.

1) Maintenance should be performed according to the procedure indicated in the Operation Manual.
   Improper handling can cause damage and malfunction of equipment and machinery.
2) Maintenance work
   Compressed air can be dangerous when handled incorrectly. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel with sufficient knowledge and experience pertaining to pneumatic equipment.
3) Draining
   Remove condensate from air filters and mist separators regularly. If the collected drainage is drained to the downstream side, it can stick inside of the product, causing operation failure and failure to reach the specified vacuum pressure.
4) Replace the filter element built into the ejector and the vacuum pump system and the silencer regularly. (Refer to the replacement procedure below.)
   It is recommended to replace the filter element and the silencer when the pressure drop reaches 5kPa as a guideline. The replacement cycle varies depending on the operating conditions, operating environment and supply air quality.
   However, if there is a vacuum pressure drop and/or delay in the vacuum (adsorption) response time which causes problem with the settings during operation, stop the operation of the product and replace the element regardless of the above mentioned replacement guideline.
5) Operation in an environment where there is a lot of dust in the air
   The processing capacity of the filter element built into the product may be insufficient. It is recommended to use SMC's air suction filter (ZFA, ZFB, ZFC series) in order to avoid problems beforehand.
6) Check before and after the maintenance work
   When the product is to be removed, turn off the power supply, and be sure to cut off the supply pressure and exhaust the compressed air. Confirm that the air is released to atmosphere.
   When mounting the product after the maintenance work, supply compressed air, connect to the power, check if it functions properly and have a leakage inspection. Especially for the latching type supply valve, be sure to check that the supply valve is OFF in the initial condition because it is possible that it is ON due to vibration.
7) Do not disassemble or modify the product, other than the replacement parts specified in this manual.

■Spare parts list

No.	Description [Application]	Model	Remarks
(7)	Supply valve [Generates vacuum.]	ZB1-VQ110U-□□□	N.C.
		ZB1-VQ110L-□□□	Latching
		ZB1-VQ120U-□□□	N.C.
(8)	Release valve [Releases vacuum]	ZB1-VQ110-□□□	N.C.
(9)	V-port Assembly [For vacuum port]	ZB1-VPN3-□-A	
(10)	Exchange the One-touch tube fittings with the port plugs	KJ□□-C1	
(11)	Filter element [For suction filter]	ZB1-FE3-A	
(12)	Silencer [For silencer]	ZB1-SE1-A	
(13)	Pressure sensor assembly	ZB1-PS□-A	
(14)	Pressure switch assembly for vacuum	ZB1-ZS□□□□-A	
(15)	Manifold base assembly	ZZB□-□□□	

5 Maintenance(cont.)

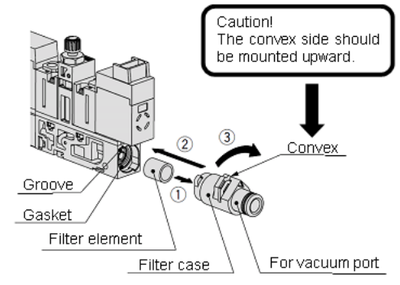
■Replacement Procedure for Filter Element

- Hold the V port assembly with your fingers, and turn it45 degrees in the counter-clockwise direction and pull it out.
  For the straight type One-touch tube fitting, it can be removed by using a hexagon wrench (width across flats: 2).
- Remove the filter element from the removed filter case, and mount a new filter element securely to the back of the case. (See Fig. to the right)
- Confirm that the filter case gasket is not displaced and that it has no foreign matter stuck to it.
- Insert the V port assembly into the ejector/vacuum pump system (Fig. to the right), press it slightly and turn it for approximately 45 degrees in the clockwise direction until it stops. (See Fig. to the right)

(Mount the V port assembly in the direction specified in the figure. If the

Note) For the locking type manual override, be sure to release the lock before starting the normal operation.

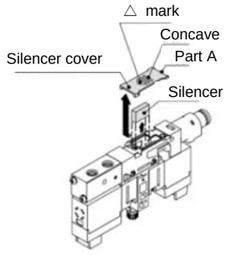
case and the element.)



■Replacement procedure for silencer*

- Turn the body upside down. Apply a watchmaker's screw driver or your finger to the notch, and slide the silencer cover in the direction indicated by the △ mark.
- When it clicks, the hook is disconnected. Put your Pry up and remove part A, cover.
- Remove the silencer by using a watchmaker's screw driver.
- Insert a new silencer, and mount the cover by the reverse procedure of the disassembly procedure for reassembly.
  (When replacing the silencer, the metal diffuser can be seen. This part is important to the function. Do not touch or apply force to the metal diffuser when replacing the silencer.)

* For vacuum pump system, the silencer is not built in.



■Replacement Procedure for Solenoid Valves (supply valve, release valve)

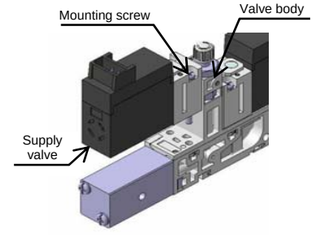
-This product has a "supply valve" for generating vacuum and a "release valve" for breaking vacuum. Follow the procedure below to replace the solenoid valves after the product has been used for a long period of time or malfunctions.

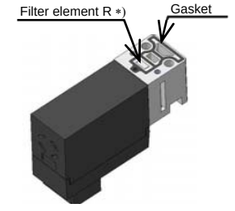
1) Remove the mounting screw of the solenoid valve.
2) Remove the solenoid valve.
3) Before mounting the replacement solenoid valve, check that it has no dust or scratches on the mounting surface. Be certain that the gasket and filter element R of the supply valve are properly mounted as well. (Filter element R is installed in the release valve only.)
4) Tighten the mounting screw of the solenoid valve to the specified torque below.

Appropriate tightening torque (Nm)	0.054 to 0.08

- When replacing the solenoid valves, the valve body will come off if both the supply valve and the release valve are removed at the same time. Removal and mounting of the solenoid valves should be done one at a time to prevent parts from dropping and foreign matter from entering.

* Function of the filter element R: When the supply valve is switched OFF from ON, atmospheric pressure flows from the vent port into the space inside the valve where there is "vacuum pressure". Filter element R is a filter mounted in the flow path. It prevents the dust in the operating environment from entering inside the solenoid valve.



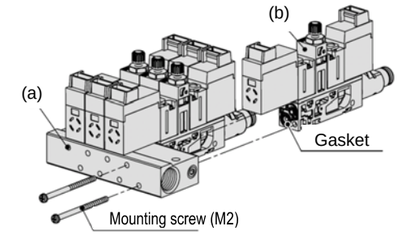


Manifold Products

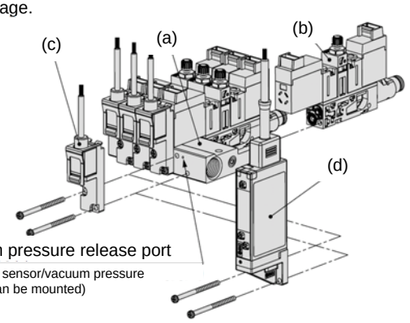
■Increasing and Decreasing the Number of Manifold Stations

- When decreasing the number of manifold stations, order the manifold base (a) exclusive for the required number of stations. When increasing the number of stations, order the required number of single units of the body type 3 valve (b). Refer to Model Indication and How to Order for the part numbers for placing an order. The part number for the manifold base is different depending on whether pressure sensor/ vacuum pressure switch are mountable or not.
- When mounting each station, check that all the gaskets are in place and tighten the screws to the specified torque. If the tightening torque is exceeded, the body can be broken.

Appropriate tightening torque (Nm)	0.075 to 0.096



- For the manifold with pressure sensor/vacuum pressure switch, order the manifold base (a) for the required number of stations. When increasing the number of stations, order the required number of single unit of the body type 3 valve (b) and the required number of either the pressure sensor assembly (c) or the vacuum pressures switch assembly (d).
- In this case, the pressure sensor (c) /vacuum pressure switch (d) is tightened together with the single unit of the product (b). (Refer to the figure on the right.)
- When mounting the pressure sensor/ vacuum pressure switch, be sure to check that the O-ring on the mounting surface of the manifold base is mounted properly and that the O-ring is not displaced from the mounting groove. If the O-ring is not mounted properly, it can cause vacuum pressure leakage.



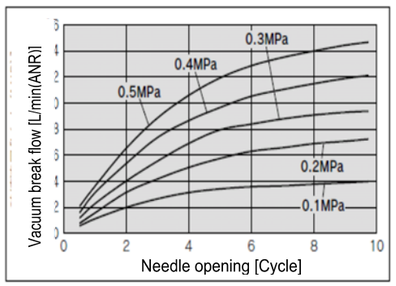
5 Maintenance(cont.)

Filter case

■Special transparent filter case made of nylon
Do not use in an environment where chemicals such as alcohol are present and where they could stick to the filter case.

Vacuum Break Flow Adjusting Needle

■Vacuum break flow characteristics
The graph on the right shows the flow characteristics with various supply pressures when the vacuum break flow adjustment needle is opened from the fully close state “n” turns.
However, the flow characteristics shown in this graph are represent values of the single unit of the product.
The flow at the absorption part may vary depending on the piping conditions to the vacuum (V) port, circuit etc.
The flow characteristics and the number of rotations of the needle vary due to the range of the specifications of the product.
■ This product has a needle retaining mechanism.
The needle stops rotating when it reaches the rotation stop position.
It may damage the product if the needle is rotated past its stop position.
■Do not tighten the needle any more after it reaches the fully closed position (fully Clockwise).
The fully closed position is when the end of the needle touches the resin hole. If it is tightened any more after the needle reaches the position where it stops, the resin part will be deformed, causing breakage.
■Do not tighten the handle with tools such as pliers.
This can result in breakage due to idle turning.



Exhaust from Ejector

■Avoid back pressure being applied to the exhaust air of the ejector.
The exhaust resistance should be as small as possible to obtain the full ejector performance.
There should be no shield around the exhaust port for the silencer exhaust specification. For the port exhaust specification, the back pressure increase should be 0.005MPa (5kPa) at maximum, as exhaust resistance is generated with some piping bore sizes and piping lengths. For tube ID ϕ4, as a guideline, it is recommended to make the piping length 1000mm at maximum, although it varies depending on the condition of the equipment at the end.
For the silencer exhaust specification, the silencer will gradually get clogged if dust in the operating environment is sucked in or if the supply air is not clean enough. If the silencer is clogged, back pressure is applied to the ejector exhaust which results in a reduction in the vacuum pressure and the adsorption flow rate.

7 Contacts

AUSTRIA	(43) 2262 62280-0	**LATVIA**	(371) 781 77 00
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CZECH REP.	(420) 541 424 611	**NORWAY**	(47) 67 12 90 20
DENMARK	(45) 7025 2900	**POLAND**	(48) 22 211 9600
ESTONIA	(372) 651 0370	**PORTUGAL**	(351) 21 471 1880
FINLAND	(358) 207 513513	**ROMANIA**	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	**SLOVAKIA**	(421) 2 444 56725
GERMANY	(49) 6103 4020	**SLOVENIA**	(386) 73 885 412
GREECE	(30) 210 271 7265	**SPAIN**	(34) 945 184 100
HUNGARY	(36) 23 511 390	**SWEDEN**	(46) 8 603 1200
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